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A VARIABLE LIGHT POLARIZING COATING

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The use of a self orienting dichroic coating solution to produce a light polarizing filter makes possible several new and unusual forms of light values.

By controlled evaporation of a dichroic nematic liquid crystal forming solution, a light polarizing film can be produced which will have the orientation of the base on which it is solidified. (U.S.P. 2,400,877) the oriented surface Beilby layer (Beilby "Aggregation and Flow of Solids") is sufficient to direct the orientation of the polarizing molecules during their solidification by drying.

Since the Beilby layer can be readily oriented by rubbing, the direction of orientation of the subsequent polarizing is simply controlled. As an example, the surface of glass can be rubbed with a felt pad wet with a slurry of rouge. This rubbing should be done with sufficient pressure to orient the surface of the glass, yet without excess pressure which would abrade off the Beilby layer. The direction of polarization to follow will be in accordance with the final direction of the rubbing. The solution is poured on and allowed to drain and dry, to produce a polarizing filter.

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The product POLACOAT is a solution of a mixture of several dichroic dyes which form this self-orienting nematic state. It is balanced to give a permanent neutral light polarizing filter. The properties of a film produced from POLACOAT No. 105 are as follows:

Transmission across the spectrum from 450 to 650 is uniform within one per cent. Above 650 and below 450 the transmission gradually increases.

Degree of polarization varies with the thickness of the applied film. This is controlled by the concentration of the solution used. The common polarization is 98 per cent. A higher per cent is difficult to obtain with present materials.

The dichroic ratio is 10+

As to light fastness, films behind glass exposed to the sun for one year show no visible change. A period of 24 hours in a Fadometer showed no change.

Heat resistance - films in 165° C oven for four hours showed a slight purple color which disappeared on cooling to room temperature. Films applied to a 100-watt incandescent lamp outlasted the lamp with no change.

Film strength is satisfactory for laminating directly on the film.

General stability and permanence are good, there being no readily volatile materials present.

The film can be made water insoluble by a metallizing bath.

This method for producing a polarizing filter has several unusual characteristics. First, the coating can be applied directly to a part already serving a function in a light system, such as a fluorescent lamp.

This eliminates the necessity for an additional supporting element and allows close positioning of the polarizing film. The process for production of a POLACOATED fluorescent lamp is:

> Revolve the lamp in a lathe while rubbing with a rag wet with a slurry of rouge. Wash clean and dip in the coating solution. Drain and dry. Coat with lacquer to give added abrasion resistance. The lamp acts as a support for the film. The film is close to the light source.

Secondly, the coating can be applied to surfaces which have curvature. For instance, a camera lense for a curved eye-glass can be coated.

Thirdly, the direction of the polarization can be varied at will. An example is an incandescent lamp which has been oriented radially at the round end of the bulb.

Almost any configuration can be produced at will by varying the direction of the rubbing. If we write our name on glass, the polarization resulting from the application and drying of POLACOAT solution will be in accordance with the direction of the writing motions.

One disc rubbed circularly by rotating the rubbing tool gives a pinwheel effect when viewed through a rotating uniformly-directioned polarizing plate. We have here a new kind of circular polarization.

Two discs oriented similarly by a circular motion are uniformly transparent when superimposed and revolved. These show configuration when out of line and hence give a means of visual

centering with uninterrupted vision at register.

Combinations with wave retardation cellophane produce a variety of color possibilities.

Plates half horizontal and half vertical are easily made with a sharp line of demarkation.

A set of one radially and one circumferentially oriented discs blacks out when centered. When combined with a quarter wave plate as an indicator, we have a transparent pointer.

Use of one plate having wave orientation configuration with a second rotation plate of uniform orientation produces translatory cut-off. The smoothness of direction changes which can be obtained is unique.

Two plates oriented with a curve of form $y = \frac{l}{\pi} \arccos \frac{\pi x}{l}$ gives uniform change of light intensity as one plate is moved past another in linear motion instead of the usual rotation.

For use on opaque materials such as metals, and as a polarizing mirror a solution is used which dries to a metallic appearance and polarizes by reflection.

Transparent venetian blind slats, for instance, polarizes with their orientation at such a curve will black out when completely closed and will have varying degrees of dimness in other positions.

Solutions of this type can be used as a tool to test the history and read the memory of surfaces, as well as predicting the polarizing future. For example, on coating fluorescent lamps in the condition as received from the factory, it was found that those of a certain manufacturer have a characteristic tread band

imprint which the polarizing solution revealed as oriented. It was later found that this tread was due to pressure of one of the belts used for straightening the tubes in their manufacture.